ADSORPTION ON ZEOLITES

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Study of Adsorption Sites Heterogeneity in Zeolites by Means of Coupled Microcalorimetry with Volumetry

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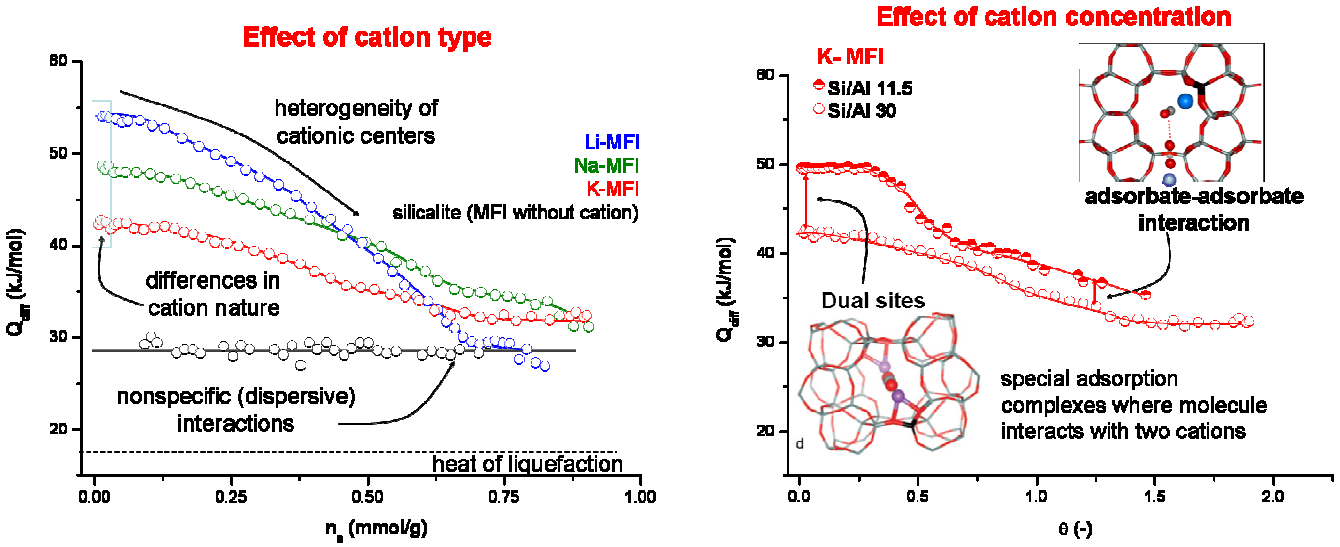

Abstract: Adsorption of CO_2 as probe molecule on alkali-metal zeolites of MFI structure was investigated by joint volumetry-calorimetry. Consideration was given to the interpretation of the heat evolved when a probe molecule is adsorbed on the surface. In particular, the number and the strength of adsorption sites are discussed as functions of zeolite structure, concentration and nature of extra-framework cation. The adsorption heats (q_{iso}) of CO_2 interaction with alkali-metal cations decrease for MFI zeolite with high Si/Al in the sequence $Li^+ > Na^+ > K^+$ from 54 kJ/mol to 49 and 43 kJ/mol, respectively. In addition, the adsorption heats are influenced by concentration of Al in the framework. This phenomenon is attributed to formation of bridged CO_2 adsorption complexes formed between two cations. On the base of quantitative analysis of adsorption processes, presence of geminal adsorption complexes was suggested for adsorption at higher equilibrium pressures.